

Factors Influencing the Citizens' Satisfaction Towards the Use of Open Government Data: A Systematic Literature Review

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Abstract: Open Government Data (OGD) is considered instrumental to promote transparency and accountability for economic and civic development that increases citizens' participation in government digital initiatives. This study employed a qualitative research design and emphasized the factors that affect the citizens' satisfaction with the use of OGD. It systematically reviewed the literature published in the field of OGD. Findings identified that ease of use, usefulness, access, extrinsic motivation, individual differences, computer skills, and training affect the citizen' use of OGD. It found models, theoretical frameworks, and theories, which have been applied, developed, or tested in the literature about citizen satisfaction with OGD. It highlighted implications for policymakers to increase the quality of OGD portals. It may be helpful at the government level in the identification of factors that affects citizens' satisfaction with the use of OGD. It may also contribute to enhancing citizens' skills and awareness of OGD portals' use.

Keywords: Open government data, open data portals, OGD portals, OGD-Factors, citizens

1. Introduction

The development of information and communication technology (ICT) is the first step toward Open Government Data (OGD) initiatives (Johan et al., 2013). It has a direct influence on government development that leads to the social and human development of a country (Malaquias et al., 2017). ICT is an essential part of OGD initiatives and it enhances the everyday performance of the government (Adamides & Karacapilidis, 2020). Governments around the globe transform their data into digital

format, to initiate and develop OGD portals. Open data portals are ICT-based tools, that help in the development of advanced government models and improve citizen engagement (Viale, Eibl & Par- ycek, 2018). OGD initiatives support development programs, eradicate corruption, and track citi- zens' services (Obama, 2009). The key aim of OGD is to make data available to citizens with ease of access and enhance their satisfaction through OGD portals. The sustainable development and effec- tive use of OGD lead to citizen engagement that yields cooperation (Dietrich, 2015), and hence, OGD initiatives are emerging at different government levels, such as local, state, and federal (Attard et al., 2015; Nikiforova & McBride, 2021).

Government data or Public Sector Information (PSI) is "any data and information produced or commissioned by Public Sector Bodies" (Longo, 2013). OGD has begun a proactive approach to the dissemination of public information (Borglund & Engvall, 2014). It helps citizens by giving them access to data on climate change, industry and tourism, social work, health, transportation, and ed- ucation. In this way, governments inform the populace and provide them with better services (Alex- opoulos et al., 2014). Citizens need to monitor government initiatives and their legitimacy for a well- functioning democratic society. Literature showed that, OGD initiatives ensure many benefits, in- cluding policy-making and informed decisions (Kassen, 2013; Rojas et al., 2014), improving the econ- omy of a country (Jung & Park, 2015), to create expedient services and products for citizens (Bertot et al., 2014), to release and sustain OGD for better legal requirements (Janssen, 2011), and connecting to other OG partners (Wilson, 2020). Thus, citizens demand OGD (Kassen, 2019) to get its benefits (Toots et al., 2017). Despite all these benefits, citizens criticized the availability or completeness of government data (Verma & Gupta, 2015).

Three major ambitions for using OGD among citizens have been identified in the literature, in- cluding transparency, releasing social and economic value, and participatory government (Attard, Orlandi, & Auer, 2016; Janssen (2011). For data to be transparent, stakeholders must have access to it, as well as the ability to utilize, reuse, and share it. Publishing public domain data sets encourage stakeholders to create new services (Janssen, 2011). The largest producers and collectors of data across a variety of fields are governments (Alexopoulos et al., 2014) and the intended uses of these data sets have changed from what was initially planned. Instead of only occasionally casting a ballot in an election every few years, participatory governance allows citizens to actively participate in processes such as policy and decision-making.

The number of published datasets by administrations is considered the success of OGD initia- tives. However, the quality of data sets and their use are more significant for their success (Janssen et al., 2012; Mergel, Kleibrink & Sörvik, 2018), and OGD data has no worth without data sets utili- zation (Lourenço, 2015; Palmirani, 2014). Utilizing open data has a significant impact on many as- pects of sustainable development, including inclusive governance, accountability, transparency, and economic growth (Nations, 2016).

No study describes the factors that influence OGD consumption from the viewpoints of citizens, based on a literature review. Further, this study is an extension of the previously published study by Warraich, Rasool & Sajid (2019) that review the challenges regarding the effect of citizens' use of OGD literature. However, the current study identified factors that influence citizens' satisfaction to use OGD through the systematized review of the previously published study. Moreover, this study

pointed out the theoretical foundations, methodologies used, and geographical areas in the reviewed studies. For government officials and policymakers, this study will be useful in determining how technological advancements in IT may impact OGD. The results of the current study will be useful for government decision-makers, in formulating policies related to citizen awareness, motivation, and IT development abilities for OGD.

1.1. Statement of the problem

ICT tremendously changed government operations and OGD emerged to ratify transparency and encourage citizens' involvement to re-use public data (Okamoto, 2017). Technical, economic, and social issues affect the development of e-government and citizens' involvement (Alshawi & Alalwany, 2009), though its development and management appraisal are still in the infancy stage. Different studies investigated myths about OGD (Janssen et al., 2012), OGD challenges (Janssen et al., 2015), and the influence of OGD on citizens' perceptions (Gonzalez-Zapata et al., 2015; Hellberg et al., 2015; Okamoto, 2017; Wilson, 2020; Wirtz, et al., 2018; Wirtz et al., 2015; Zuiderwijk et al., 2014). However, it was found that no comprehensive review has been conducted that holistically provides the factors affecting citizens' satisfaction with the use of OGD. Therefore, it was essentially desired to conduct a study about factors affecting OGD from citizens' perspectives to fill the knowledge gap.

1.2. Research Questions

The key objective of this study is to evaluate published literature on OGD from citizens' perspectives. The subsequent research questions were established to encounter the objectives of this study:

- Which geographical area, the selected studies belonged to, and which methodologies were used in the selected studies?
- What are the models, theoretical frameworks and theories, which have been specified (i.e., applied, developed, or tested) in the earlier research studies about citizens' satisfaction with OGD?
- What are the factors affecting the citizens' satisfaction with the use of OGD?

2. Method

The article focused on, evaluating empirically published literature on the factors influencing citizens' satisfaction with the use of OGD. This study followed the "Preferred reporting items for systematic review and meta-analysis protocols" (PRISMA-P 2015) guidelines to review the literature (Moher et al., 2015). The literature shows that studies have adopted PRISMA guidelines to conduct a systematic review in the OGD context (Ibrahim, Abdullah & Arief, 2021; Mokobombang, Gutierrez & Petrova, 2020; Ruijter, & Martinius, 2017; Warraich, Rasool & Sajid, 2019).

2.1. Search Strategy

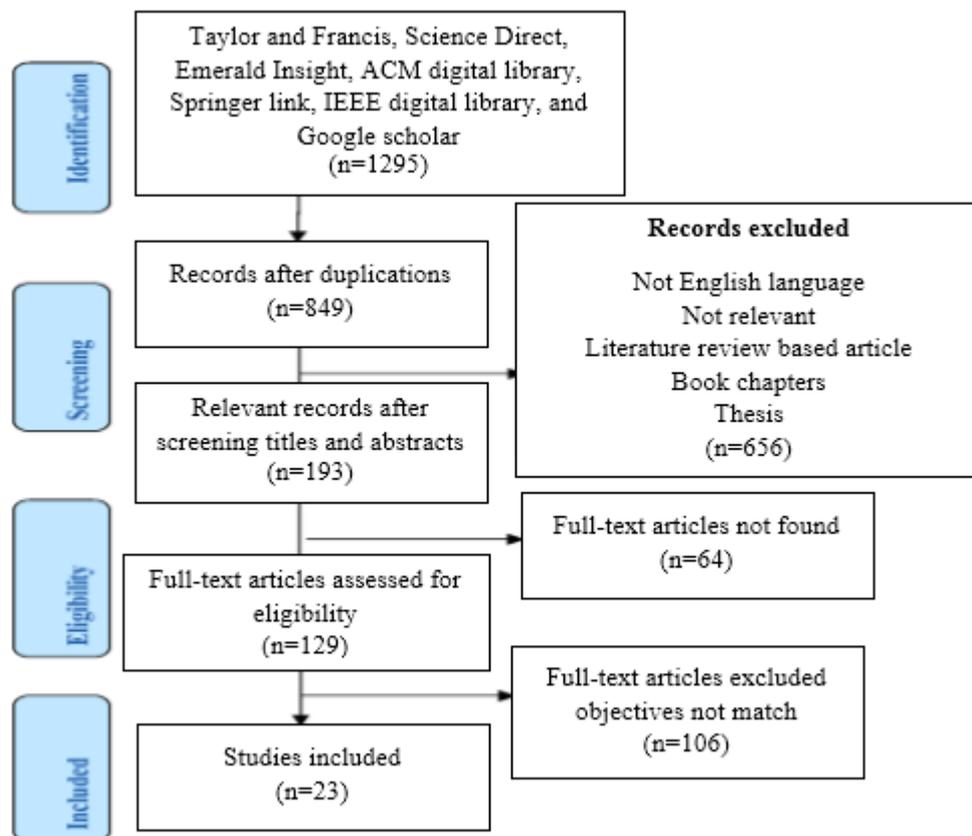
An inclusive search strategy was conducted in ACM Digital Library, Emerald Insight, Google Scholar, IEEE Digital Library, Science Direct, Springer Link, and Taylor and Francis. Researchers

also conducted a manual search to get the maximum number of related studies. The backward and forward-searching technique was used. The forward search was done by searching citations, using the Google Scholar option “cited by”. Researchers also used the “related articles” option of Google Scholar for the manual search. For the backward search, researchers scanned and downloaded a reference list of most related studies. The following search terms were used to search literature from scholarly databases:

“Open government data” OR “Open data” OR “Open data portals” AND “Citizen”

The TITLE-ABSTR-KEYWORD was selected for a more focused search strategy. One thousand two hundred and ninety-five (1295) articles were found containing journal articles, conference papers, book chapters, and theses. There was no restriction on the languages and the year of publication of studies in the search strategy.

Figure 1: Flow Diagram of Selection Process of Studies



2.2. Inclusion and Exclusion Criteria

This study found related articles from 2012 to 2021 about open government data for systematic review. The search results included journal articles, conference papers, book chapters, reports, and theses. Only English language studies available in full-text were included for review.

2.3. The procedure of selection or extraction of studies

Boolean search operators AND/OR were applied in the search query to search databases i.e. ACM digital library, Emerald Insight, Google scholar, IEEE digital library, Science Direct, Springer link, and Taylor and Francis, and one thousand two hundred and ninety-five studies (1259) were found as search results. Figure 1, showed the complete inclusion and exclusion criteria. Screening of identified studies is shown in two stages. After screening the title and abstract, one hundred and ninety-three (193) studies were found. One hundred and twenty-nine studies were eligible for the review, according to the title and abstract. The title, abstract, and objectives were analysed at the final inclusion stage. Twenty-three studies available in the full text were finally included in the study. Only empirical-based research studies were nominated for the final selection. This study evaluated the authors, year of publication, methods, sample, and findings of included studies for review.

3. Results

3.1. Characteristics of the publications

This study found twenty-three relevant studies, published from 2012 to 2021. The selected studies were published in journals including; administrative sciences, applied sciences, education and development, e-government, engineering, informatics, information processing and management, information systems, sustainable cities, and telematics. The sample included; general citizens, businessmen, CEOs, engineers, information officers, professors/teachers and students, project managers, and website developers. The sample population belongs to the age group 18-75 years, with the education level from secondary school certification to a Ph.D. degree. Various data collection methods, such as interviews, survey questions, focus groups, a documentary research approach and storytelling methodology, experimental design, or content analysis to collect data, were utilized in the selected studies. Model and framework used in these studies are: Adjusted diffusion of innovation model, a Benchmarking framework for usability, Citizen engagement models, Institutional theory, ITIL (Information technology infrastructure library) service lifecycle model, Organizational network theory, Rogers' diffusion of innovations theory, Technology acceptance model (TAM), Training needs analysis (TNA) model, Unified theory of acceptance and use of technology (UTAUT) framework.

Table 1: Selected Studies on Open Government Data (N=23)

Open Government data	
Reviewed Studies	23
Research methods	8= quantitative research, 9= qualitative research, 6= Mixed methods
Publication year	2010 to 2021 (one=2021, three=2020, two=2019, four=2018, four=2017, three=2016, Four=2014, one= 2013, and one=2012).

Journals fields	Administrative sciences, applied sciences, education and development, e-government, engineering, information processing and management, information systems, sustainable cities and society and telematics and informatics.
Countries in which studies conducted	Brazil, Chile, China, Colombia, Croatia, Estonia, Ireland, Germany, India, Indonesia, Japan, Kenya, Malaysia, Netherland, New Zealand, Russia, Sweden, Oman, Philippines, Spain, Switzerland, UK, and USA.
Sample population	From a diverse sample population such as general citizens, businessmen, CEOs, engineers, information officers, professors/teachers and students, project managers, and websites developers, etc.
Sample size	07- 3212
Sample education	Secondary school certificate to Ph.D.
Sample population age	18-75
Data collection Instrument	A survey questionnaire as an instrument was used in 7 studies. Nine studies used the interview, and eight studies used a mixed methods approach, i.e. questionnaire and interview, focus group or content analysis and documentary research approach as an instrument tool to collect data.
Model/frameworks	Adjusted diffusion of innovation model, Benchmarking framework for usability, Citizen engagement models, Institutional theory, ITIL (Information technology infrastructure library) service lifecycle model, Macintosh's model, Organizational network theory, Rogers' diffusion of innovations theory, theory of Co-Creation, Technology acceptance model (TAM), Training needs analysis (TNA) model, Unified theory of acceptance and use of technology (UTAUT) framework.

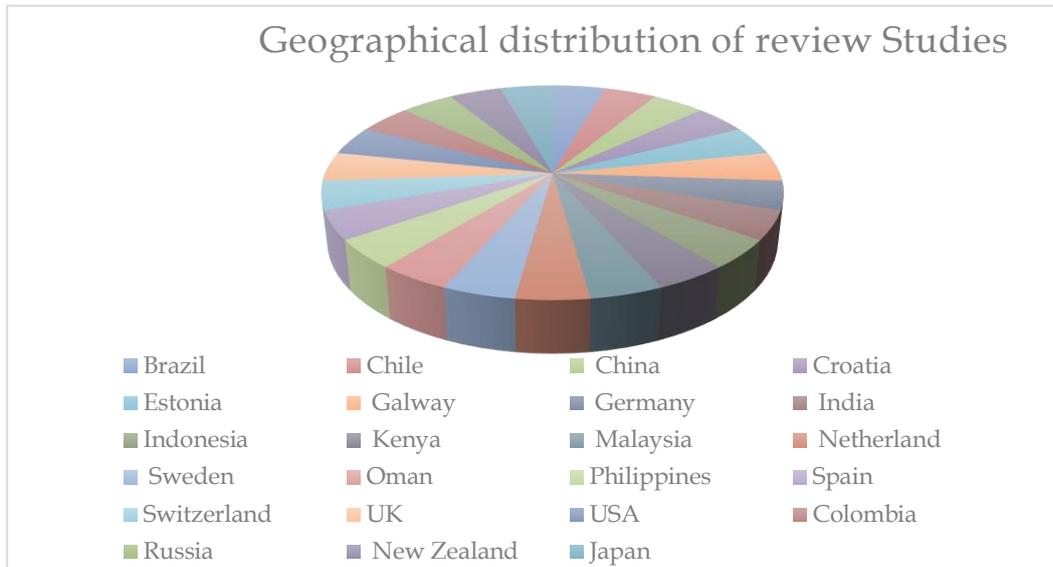
3.2. Geographical distribution, and methodologies used in the selected studies

3.2.1. Methodologies and context used in the studies

3.2.1.1. Geographical distribution of reviewed studies

Brazil, Chile, China, Croatia, Colombia, Estonia, Germany, India, Indonesia, Ireland, Japan, Kenya, Malaysia, Netherlands, New Zealand, Oman, Philippines, Russia, Spain, Switzerland, Sweden, UK, and the United States of America, were among the countries where the studies under consideration were carried out.

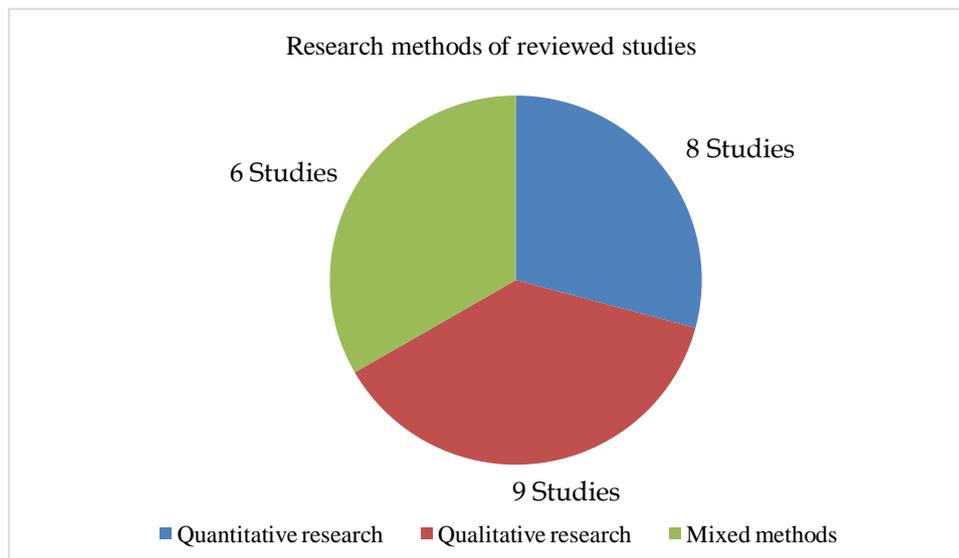
Figure 2: Geographical Distributions of Reviewed Studies



3.2.1.2. Research methods of reviewed studies

There is diversity in the research methods of reviewed studies. Eight studies used quantitative research methods, nine studies used qualitative research methods and six studies used mixed methods (Figure 3).

Figure 3: Research Methods of Reviewed Studies



3.3. Models, theoretical frameworks, and theories applied/ developed/ tested in the literature about citizens' satisfaction with OGD

Reviewed studies used different theories, theoretical models, and frameworks to assess citizens' satisfaction regarding OGD i.e. Macintosh's model, ITIL service lifecycle model, and theory of co-creation (Table 1).

Wirtz et al. (2017) applied technology acceptance theory, to investigate the backgrounds of the general public to use OGD. The TAM (technology acceptance model) focused on two factors; "perceived ease of use" and "usefulness" to ascertain users' acceptance of information systems (Davis, 1985). Wirtz et al. (2017) study proved the rationality of the technology acceptance model and provided evidence of "ease of use" and "usefulness" factors regarding OGD from citizens' perspectives.

Callinan et al. (2017) proposed a research model to examine the factors affecting open data usage from the perception of citizens, and found the "theory of co-creation" as an analytical tool to develop the model. In the proposed model, awareness, social capital, trust, and simplicity of task are moderating variables that potentially modify the relationship between citizens and open data usage. Moreover, Nilsson and Barbutin (2019) used Macintosh's model (2004) in their study for identifying factors about the use, and access to, the '*Uganda digital platform*' by citizens. However, Purwanto, Zuiderwijk, and Janssen (2020) proposed a conceptual '*model of conditions and factors of OGD citizen-led engagement*' and empirically test it. Their study also examined factors affecting citizen engagement with OGD.

The TAM is frequently used in research studies for examining the acceptance of technology by users (Venkatesh & Davis, 2000). Wu (2020) used the TAM in the study and identified the factors that affect users' behaviours while using government sites. Saxena and Janssen (2017) used the UTAUT (Unified theory of acceptance and use of technology) framework in their study and assessed the behavioural intention of the citizen to use and accept OGD.

Zuiderwijk and Janssen (2014) used '*institutional theory*' to investigate the negative effects of OGD on citizens' intention to use open data. This theory claims a complex and repeated connection between social organizations and innovative technologies (Luna-Reyes & Gil-Garcia, 2011). On the contrary, Smith and Sandberg (2018) adapted the '*information technology infrastructure library*' (ITIL) service lifecycle (Taylor, 2007) and identified barriers that affect the citizens' use of OGD. This model has five stages; "*strategy, design, transition, operation, and continual improvement*".

Weerakkody et al. (2017) proposed an '*adjusted diffusion of innovation model*' based on "*Rogers' diffusion of innovations theory*" (DOI). This study determined the predictors that empirically influence the citizens' use of open data. Moreover, Nikiforova and McBride (2021) adopted a '*user-centered evaluation approach*' based on the proposed benchmarking framework by Máchová et al. (2018) for the usability of OGD. Usability evaluation emphasizes the ease of use of open data portals for users to attain the aims of OGD.

Table 2: Comparison of Review of Studies on OGD (n=23)

S. No.	Author/ Year	Research Method	Theoretical framework	Major findings	Corresponding solutions
1)	Ahmed et al. (2017).	Mixed -methods	Expectation confirmation theory (ECT)	Access to open data and services is considered crucial for economic and social development. The citizens who are not satisfied with the available data are, consequently, not motivated to use it. Users believe that their technology efficacy strengthens their intention to use OGD.	Policymakers should meet the citizens' satisfaction level. If the users stop using the OGD services, there will be no benefit for service providers and citizens.
2)	Bright et al. (2019).	Quantitative	NA	Poor transparency of OGD decreases downloads by the citizens from OGD. It may affect the usage of OGD and the trust of citizens.	A good transparency dataset is more priority for the users and might be downloaded hundred times by people. So, the transparency of the OGD dataset should increase by service providers.
3)	Brugger et al. (2016).	Mixed -methods	Visualization production process model	Users want data that is improved in terms of accessibility and ease of use. Lack of knowledge and skills avert users to use available government data.	OGD service providers should be escorted by user support. Data visualization tool should be implemented in OGD infrastructure.
4)	Callinan et al. (2017).	Quantitative	Theory of co-creation -proposed a research model	Lack of awareness is a factor that affects the usage of OGD, and, due to this, citizens are unable to access OGD.	Governmental bodies should pay greater attention to the benefits of end-users regarding OGD.
5)	Canares et al. (2016).	Qualitative/Action research	Training Needs Analysis	Computer skills are important and useful to access, use and download OGD. Several users have adequate hardware and internet connection that can facilitate them in using OGD for their work.	The capacity-building programs should be relevant to the circumstances and needs of the learners. The capacity-building providers should

					focus on actual production that satisfies citizens and communities. The long-term training program should be conducted for the open data service providers.
6)	Cantador, Cortés-Cediel & Fernández (2020).	Qualitative	CONSUL e-participation framework	Lack of access to technology is a factor that is the cause of low participation of citizens to use open data. Socioeconomic factors influence on citizen participation to use OGD.	Training opportunities for citizens during unemployment support them in engaging open data. Open data should consider the information needs of citizens, business persons, and politicians differently.
7)	Gascó-Hernández et al. (2018).	Mixed - methods	Open Data Institute (ODI) framework	Training increase users' skills and encourage them to use OGD. The awareness about the OGD and its benefits increase its usage.	OGD trainings are more important and supportive to enhance the use of OGD.
8)	Janssen et al. (2012).	Mixed methods	Systems theory, Institutional theory	The use of open data might not be easy due to users' unawareness. Users need motivations, skills, capabilities, and resources for using OGD services. OGD promote transparency and participation.	Citizens should have a certain level of capabilities and knowledge to use more sophisticated and complex data sets and to disseminate open data on a large scale. The victory of open data systems depends on the use and the quality of the data provided to the users.
9)	Magalhães & Roseira (2016).	Qualitative	Proposed a framework on the indicators; resources, data accessibility, data usability, interaction, and legislation.	Users have to face difficulties to access required data. Data usability is concerned with the data quality which is deficient in the part of OGD. Most data sets include the issues of	Data sets' standardization and licensing are considered critical sides of OGD use, that should be focused on by the authorities. There should be a data validation mechanism

				timeliness, accuracy and incomplete data.	at firms. Government should find champions to promote the use of OGD and remove issues that are a hindrance in the use of OGD.
10)	(Matheus et al. (2014).	Qualitative	NA	OGD portals, which have active dashboards, are easy to use and quickly accessible to the public.	Government should develop open data policies that encourage citizens to use OGD portals.
11)	Nikiforova & McBride (2021).	Mixed method	Proposed a usability framework based on benchmarking framework for usability proposed by (M'achov'a et al., 2018).	The usability of open data portals is questionable. There was a poorest interaction among OGD users and OGS providers.	Governments and OGD developers should focus on the OGD ecosystems.
12)	Nilsson & Barbutin (2019).	Quantitative	Macintosh's model (2004)	Limited access to ICT affects citizens in the e-participation system. Lack of ICT training is a factor that decreases the usage of OGD. ICT literacy training is important for citizens. Citizens who attended training may train others. Training is also a method of communicating with others about the use of ICT. Without ICT skills users are unable to use OGD.	ICT should be part of all levels of the educational curriculum. Leaders should be involved in the OGD early projects.
13)	Odongo & Rono (2016).	Mixed methods	Proposed a Conceptual model of OGD opportunity generation	Access empowers citizens towards OGD usage. Internet access and usability of citizens are critical for the insurance of equality dissemination of OGD. Data transparency help in decision making and accountability.	Governments should focus on the OGD to increase the usability and re-usability of data.

14)	Purwanto, Zuiderwijk, & Janssen (2018).	Qualitative	NA	Limited access to OGD is factors that influence the usage of OGD. Individual factors of citizens may affect the effective usage of OGD sites.	The data that are relevant and important for the citizens should be highlighted and released by the government. Feedback given by the citizens must be replied to and followed up positively.
15)	Purwanto, Zuiderwijk, & Janssen (2020).	Qualitative	“a conceptual model of conditions and factors of OGD citizen-led engagement”	Citizens perceived OGD usefulness motivates them to explore OGD. Training is important for educating citizens about OGD. Less training opportunities may affect the usage of OGD. Diversity in citizens' skills may affect their OGD use i.e. data analytics and statistics. Citizens' perceived ease of engagement motivates them to use open data.	The government should highlight those settings that enhance citizen engagement with OGD. Government should contribute at the organizational level as well as the societal level to increase OGD value among citizens and increase its usage.
16)	Saxena & Janssen (2017).	Quantitative	Unified Theory of Acceptance and Use of Technology (UTAUT) framework	When citizens believe that OGD will help them in earning more, get certain benefits and enhance their expectancy to perform well professionally, it makes them more motivated to use open data technologies such as open data platforms, software, and tools.	Government should promote public value which ultimately encourages citizens to use government data. Governmental bodies may provide technical support to users when they report their specific issues.
17)	Smith & Sandberg (2018).	Qualitative	ITIL service lifecycle (Taylor, 2007)	Citizens face problems communicating with OGD providers for getting help to use it. It is also noted that there is no guarantee of the quality of data in OGD portals.	OGD initiatives are facilitators for the citizens so, OGD systems should support citizens and attract them towards the OGD innovation.
18)	Varga et al. (2014).	Qualitative	Proposed model for role of data user,	The ease of access is important to access data through a single portal. If users approach central	Government should define OGD, change its culture by defining strategies by

			data portal and data supplier	metadata, open data can easily be accessible.	following leading OGD initiative at world and monitor users' activities on OGD portals. Privacy of citizens is more concerned in open data so, OGD authorities should think about it.
19)	Weerakody et al. (2017).	Quantitative	Proposed "adjusted diffusion of innovation model" based on "Rogers' diffusion of innovations theory" (DOI).	Citizens think that OGD portals are a better means for them to communicate with the government. It is also tough for citizens to identify and use the tools/training that the government offers them to enhance their involvement and understand-ability of these datasets.	Citizens need to be educated regarding the usefulness of OGD that provides them an opportunity to use it in their daily decision-making as well as to participate in policy-making processes. The government needs to offer incentives to citizens to use OGD portals.
20)	Wirtz et al. (2017).	Quantitative	The technology acceptance model (TAM).	Word of mouth, ease of use has a positive impact on citizens' intention to use OGD portals. Citizens give importance to using a service that is recommended by other citizens. It enhances their intention to use OGD. Ease of use alludes to the learning efforts that are necessary for citizens to be able to use OGD and it is also associated with the usability and traceability of open government portals. Intrinsic motivations such as enjoyment, social altruism, and social influences from friends are important factors that affect the users' overall engagement to use OGD.	OGD should increase transparency, contribution, and collaboration through content-related services and enhance citizens' expectations. OGD specialists should keenly observe the word-of-mouth-related risks and opportunities from the perspective of OGD.

21)	Wirtz et al. (2018).	Quantitative	Technology acceptance and motivation theory Propose a conceptual model	The findings show that ease of use, usefulness, intrinsic motivation, and Internet competence significantly determine citizens' intention to use OGD. Usefulness is the key concern of citizens in the context of OGD. Usefulness has a strong positive effect on citizens' usage intention. Internet competence also facilitates the use of OGD.	Accessibility of the OGD should be considered by the public managers of OGD. Gamification strategies should be developed and apply to OGD systems to enhance citizens' satisfaction and enjoy in using OGD portals. There is a need to enhance citizens' performance to increase OGD use and usefulness.
22)	Wu (2020).	Quantitative	The technology acceptance model (TAM)	Socioeconomic factors, ease of use and convenient access affects the users' perception and they admit and use the innovations OGD.	Usage of OGD systems is a challenge for the public managers, they need to adopt strategies to enhance OGD usage among citizens. Public Mangers need to know the users motive of OGD usage and provide access in a less cost.
23)	Zuiderwijk & Janssen (2014).	Qualitative	Decision-making model	Data providers sometimes provide limited access to datasets to keep control over complex datasets. However, sometimes the restricted access was not appropriate for the users. Transparency, and strengthened economic growth are the benefits of the OGD.	Decision support is lacking which interns impact on the actual usage of OGD. There should be a good decisions making process to release and monitor OGD to reduce dark side of OGD.

3.4. Factors affecting the citizens' satisfaction with the use of OGD

There are different factors affecting citizens' satisfaction to use OGD. Literature established that access, usefulness, training to use open data portals, individual differences, transparency, computer skills, ease of use, extrinsic motivation, and socioeconomic attributes are major factors that affect the citizens' satisfaction with the use of OGD.

3.4.1. Access

Data providers sometimes provide limited access to datasets, to keep control over complex datasets. So they might apply some conditions to use these datasets, such as, users' plan and purpose to use the data and their background. However, sometimes the restricted access was not appropriate for the users (Zuiderwijk & Janssen, 2014) and they have to face difficulties to access the required data (Magalhães & Roseira, 2016). Access to open data and services is considered crucial for economic and social development of a society. The citizens who are not satisfied with the available data consequently are not motivated to use it (Ahmed et al., 2017). Convenient access to citizens' data is the main function of smart cities (Wu, 2020) though, lack of access to technology is the cause of low participation to use open data among citizens (Cantador, Cortés-Cediel & Fernández, 2020). Limited access to ICT influences the usage of OGD (Purwanto, Zuiderwijk & Janssen, 2018) and other e-participation systems (Nilsson & Barbutiu, 2019) among citizens.

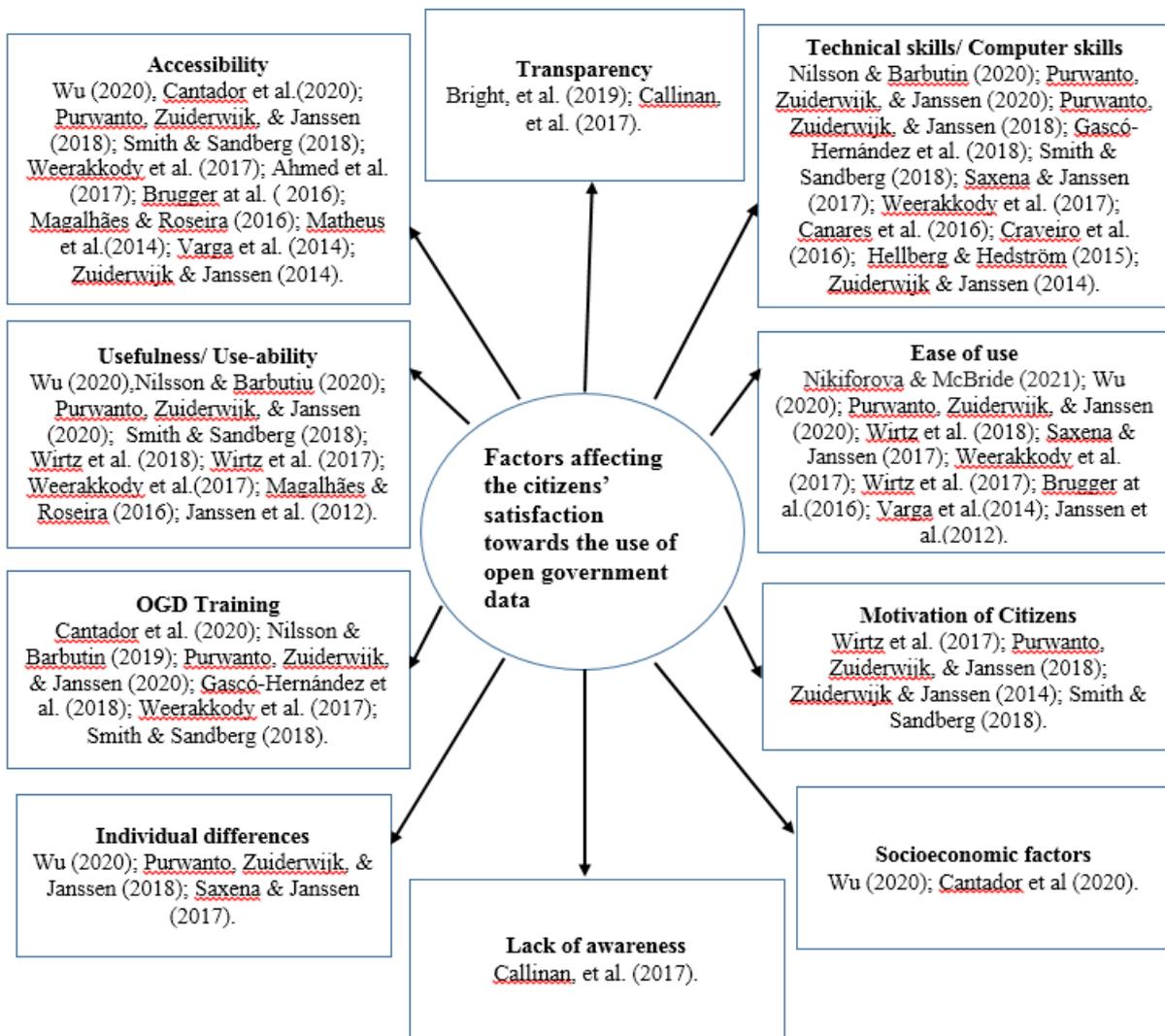
3.4.2. Usefulness

Usefulness indicates the degree to which citizens trust that using OGD improves their performance (Khurshid et al., 2022). It is assumed in the technology acceptance model that the usefulness, and ease of use of OGD have a constructive influence on citizens' intent to use OGD. Citizens are particularly willing to use OGD due to its usefulness. Their apparent utility is particularly dependent on how simple an OGD portal is for users. They may easily access, find, and comprehend the particular data offered by OGD portals (Ma & Liu, 2004).

Citizens need to be educated regarding the usefulness of OGD, which provides them an opportunity to use it in their daily decision-making, in addition to contributing to policy-making processes. Citizens think that OGD portals are a better means for them to communicate with the government. The government needs to offer incentives to citizens to use OGD portals (Weerakkody et al., 2017). Odongo and Rono (2016) discussed about citizens' awareness level regarding OGD and its usage. However, citizens who have a negative perception about OGD usefulness, are hesitant to use it (Weerakkody et al., 2017). There is a need to develop an infrastructure that handles data in an easy-to-use way to publicize it. Janssen et al., (2012) argued that citizens should have a certain level of capabilities and knowledge to use more sophisticated and complex data sets and disseminate open data on a large scale.

Usefulness is the key concern of citizens in the context of OGD. It has a strong constructive influence on citizens' usage intent. There is a need to enhance citizens' digital skills to increase OGD use and usefulness (Wirtz et al., 2018). Moreover, word of mouth has an optimistic influence on citizens' intent to use OGD portals. Citizens prefer to use a service that is recommended by other citizens, or their peers, as it enhances their intention to use OGD (Wirtz et al., 2017). Socioeconomic factors; social status, education, and social mobility are the issues that interrupt the usage of e-government sites (Wu, 2020). Citizens perceived that OGD's usefulness motivates them to explore OGD portals (Purwanto, Zuiderwijk & Janssen, 2020). Data usability is concerned with the data quality which is deficient on the part of OGD (Magalhães & Roseira, 2016).

Figure 4: Factors Affecting the Citizens' Satisfaction with the Use of OGD



3.4.3. Training to use open data portals

The open data portal training is considered more effective for interaction with the government and increases the knowledge of citizens. This training is critical to facilitate the users with unique characteristics, interests, and expectations in specific contexts. However, training increases users' skills and encourages them to use OGD (Gascó-Hernández et al., 2018). It is also challenging for citizens to find, and use, the training tools which the government offers them, to enhance their involvement and understanding of these datasets (Weerakkody et al., 2017). Citizens face problems to communicate with OGD providers for getting help to use it (Smith & Sandberg, 2018). Internet competence also facilitates the users' about OGD usage (Wirtz et al., 2018). Training is important for educating citizens about OGD as the less training opportunities may affect the usage of OGD (Purwanto, Zuiderwijk & Janssen, 2020). ICT literacy training is important for citizens because who attended training may train others. Training is also a method of communicating with others about the use of ICT (Nilsson & Barbutiu, 2019).

3.4.4. Individual differences

Individual differences are also there to impact the use of OGD among the respondents. These individual differences, such as gender, age, education, and income have an impact on users' pattern to use open data directly or indirectly (Wu, 2020). Citizens' individual differences may affect their effective usage of OGD portals (Purwanto, Zuiderwijk & Janssen, 2018). When citizens believe that OGD will help them in earning more, get certain benefits and enhance their expectancy to perform well professionally, it makes them more motivated to use technologies of open data, such as open data platforms, tools, and software (Saxena & Janssen, 2017).

3.4.5. Transparency

Grimmelikhuisen and Meijer (2012) defined transparency as "the availability of information about an organization or actor, allowing external actors to monitor the internal workings or performance of that organization" (p. 139). Poor transparency of OGD decreases downloads by the citizens from OGD. It may affect the usage of OGD and the trust of citizens (Bright et al., 2019). Transparency is a factor that affects the use of OGD (Callinan et al., 2017).

3.4.6. Computer skills

Computer skills are important and useful to access, use and download relevant data from OGD. Several users have adequate hardware and internet connection that can facilitate them in using OGD for their work (Canares et al., 2016). Users believe that their technology efficacy strengthens their intention to use OGD. They are satisfied with the service or product of OGD portals (Ahmed et al., 2017). Lack of digital skills is challenging while using OGD, especially for underprivileged users groups, such as illiterate women and minorities. Technical and communication skills are considerable now and should be a part of all levels of the educational curriculum. ICT skills are important for citizens, without them, they cannot access information and manage real devices (Nilsson & Barbutiu, 2019).

3.4.7. Ease of use

In the context of OGD, 'ease of use' is considered the key concern of citizens (Wirtz et al., 2018). It refers to the learning efforts of citizens that are essential for the usage of OGD and it is also associated with the usability and traceability of open government portals. This data is provided through the navigational elements of these portals (Wirtz et al, 2017). The amount of ease is also related to technology usage (Venkatesh et al., 2003). Ease of use or difficulty to open data is dependent on a person's tendency to use them. It is also linked with the mandatory skills needed to use the obligatory data sets. Hence, users prefer to use data sets that are easily accessible and they put in the least effort to use those portals. OGD initiatives are founded on the values of openness, accountability, and citizen participation in governance. As a result, open data sets are made available for reuse by citizens. Though, users want information that has been improved in its ease of use and accessibility (Brugger et al., 2016). OGD portals, which have active dashboards, are easy to use and quickly accessible to the public (Matheus et al., 2014). The ease of access is important when accessing data

through a single portal and, if users approach central metadata, open data is readily available (Varga et al., 2014). The ease of use affects the users' perception and they admit and use the innovations (Wu, 2020). Citizens' perceived ease of engagement also motivates them to use open data (Purwanto, Zuiderwijk, & Janssen, 2020). Moreover, Nikiforova and McBride (2021) identified weaknesses in the usability of 41 OGD portals. No one portal succeeds the usability criteria given by the study. It shows that the usability of open data portals is questionable.

3.4.8. Motivation of citizens

Citizens' intentions to use open data may be influenced by a variety of variables and may change over time. Intrinsic elements that influence consumers' overall participation with OGD include pleasure, social goodwill, and social pressure from friends (Wirtz et al., 2017). Extrinsic motivation such as low data quality, low accuracy, and expansion of social networks are key factors that influence the use of OGD. Literature also identified emerging factors, such as data quality, timeliness, incomplete data, system quality, social media, anti-corruption anticipation, apparent innovation, and disbelief that affect the citizens' engagement to use OGD (Magalhães & Roseira, 2016; Purwanto et al., 2018). It is also noted that there is no data quality assurance in OGD portals (Smith & Sandberg, 2018).

3.4.9. Socioeconomic factors

Socioeconomic factors, such as education, social mobility, and social status affect the usage of e-government websites (Wu, 2020). These factors also influence citizens' participation in the use of OGD (Cantador, Cortés-Cediel & Fernández, 2020).

3.4.10. Lack of awareness

Lack of awareness is a factor that affects the usage of OGD among citizens and they are unable to access OGD (Callinan et.al, 2017).

4. Discussion

The key objective of the study was to systematically review articles that had been published in the field of OGD regarding factors affecting the citizens' OGD use. We summarised and explained the key outcomes of our research in this section. The selected studies were conducted in different countries of the world. However, it is found that most studies were conducted in European countries. It is assumed that developed countries have good infrastructure and their people know about OGD and its benefits to society.

5. Context and methodologies used in the sample studies

Numerous techniques have been employed to explore the phenomenon of citizen interaction with OGD, as shown in the previous section. Only a small percentage of studies use mixed method techniques, log data analysis, or action research. However, case study and survey-based research approaches are overwhelmingly prevalent.

Despite their potential to facilitate more effective OGD participation from the citizens who are left behind, other research methodologies, such as critical studies, are hardly ever applied in open data research (Gurstein, 2011). By posing "state of the actual" inquiries, critical techniques enable context-rich analysis (Selwyn, 2010). As a result, researchers can take a look inside the OGD engagement setting and account for any unintended repercussions. For instance, in our sampled research, we seldom ever see people from underrepresented groups, such as the elderly or the impoverished, being invited to open data innovation contests, and even less frequently, having their viewpoints being taken into account.

We discovered that many studies, primarily utilizing quantitative survey methods, failed to mention whether or not the research subjects had any prior experience of participating in OGD.

This result suggests that the majority of the respondents to such a study may be newcomers to OGD or have never used OGD before. On the one hand, the discovery can help when pushing for improvements in OGD offering to raise citizen awareness and data literacy, to encourage interaction. On the other hand, it can offer insight into what motivates new users to participate with OGD. The research on what motivates more experienced citizens, such as application engineers or data analysts, to connect with OGD consistently, however, is scarce. To compare less experienced OGD users to more experienced ones, we advise open data researchers to determine the knowledge and expertise of study participants.

5.1. Models, theoretical frameworks, and theories used in the sample studies

Additionally, we found that some theories and models are rarely integrated, even though several theories and theoretical models were used in the sampled studies shown in table 2. For instance, models of acceptance and usage, such as '*Unified Theory of Acceptance and Use of Technology*' (UTAUT) rarely integrated with the '*Adjusted diffusion of innovation model*'.

The sample studies used diverse theories and models. Only TAM (The technology acceptance model) was used in two studies. However, these theories and models have some overlapping constructs, for example; 'perceived relative advantage' and 'performance expectancy' from the '*Diffusion of Innovation Theory*' and 'UTAUT' respectively, are engrained in the 'Self-Determination Theory' construct called 'extrinsic motivation'. Overlapping constructs are also found in UTAUT and TAM, such as usage behaviour, intentions to use/behaviour intention, and experience. To develop a comprehensive theory that may be utilized to better understand, explain, and address the issues associated with citizen participation with OGD, researchers may incorporate various components of several existing theories.

5.2. The factors affecting the citizens' satisfaction with the use of OGD

The findings of selected studies showed that access, usefulness, technical skills/computer skills, ease of use, OGD training, motivation of citizens, individual differences, socioeconomic factors, transparency, and lack of awareness are features that affect the citizens' use and satisfaction of OGD.

ICT is essential for creating e-government platforms and improving government agency performance (Mahmoud, 2015). Governments from all over the world have created OGD portals to make accessible government data. Citizens' access to technology is essential to use OGD (Craveiro et al., 2016). The findings of the reviewed studies show that accessibility is the key factor, identified in 11 studies out of 23, effects on the citizens' satisfaction and intention to use OGD. Gascó-Hernández et al. (2018) mentioned that when data are more accessible and have alternate formats then it enhances its uses. Helbig (2012) described that if OGD is provided freely and in more formats, it will increase the use of OGD portals. Citizens have the opportunity to access information quickly and in accessible formats through OGD portals (Matheus et al., 2014). Access empowers citizens to use OGD. Internet access and citizens' ability to use it are critical for the dissemination of OGD to all equally (Odongo & Rono, 2016).

Usefulness/use-ability was found in 10 studies out of 23 reviewed studies. Findings show that the perceived usefulness of OGD motivates citizens to explore OGD portals (Ma & Liu, 2004; Purwanto, Zuiderwijk & Janssen, 2020).

This study found technical skills/computer skills to be a factor affecting citizens' satisfaction and intention to use OGD in 10 studies out of 23 reviewed studies. Findings show that technical skills/computer skills are important in order to access and use OGD. Citizens accept that limited technical skills affect their intention to use OGD (Nilsson & Barbutiu, 2019; Purwanto, Zuiderwijk & Janssen, 2018). Their lack of technical skills forces them to use OGD less frequently (Gascó-Hernández et al., 2018).

Ease of use is also found as a prominent factor affecting the use of OGD portals. Findings show that OGD sites are not easy to use for the citizens because of their unawareness and lack of technical skills (Janssen et al., 2012). Citizens use OGD portals that are easy to use and according to their needs (Brugger et al., 2016). Ease of use affects the users' perception regarding the use of OGD, however, their perceived intention affects whether they encounter difficulty in accessing complex data sets (Purwanto, Zuiderwijk & Janssen, 2018; Wu, 2020). The ease of use of OGD portals motivates citizens to use OGD (Matheus et al., 2014).

Findings show that lack of ICT training is the factor that significantly affects the use of OGD. Studies found that it is difficult for the citizens to identify training tools that the government offers them for the effective use of OGD (Smith & Sandberg, 2018; Weerakkody et al., 2017). However, literature supports the fact that training opportunities are essential for the citizen to use OGD effectively (Cantador, Cortés-Cediel & Fernández, 2020; Purwanto, Zuiderwijk & Janssen, 2020). Moreover, citizens' motivation levels also affect their use of OGD (Zuiderwijk & Janssen, 2019). Users need motivations, skills, capabilities, and resources to use OGD services (Brugger et al., 2016; Janssen et al., 2012).

Individual differences are found as a factor regarding OGD use. Every individual has certain limitations regarding demographic factors (gender, age, education, and income) that affect his/her behaviour in relation to use of OGD (Purwanto, Zuiderwijk & Janssen, 2018; Saxena & Janssen, 2017; Wu, 2020). ICT development projects around the world intend to encourage socioeconomic growth by bridging the digital divide (Nayak, 2013). Education, social mobility, and social status are identified as socioeconomic factors that influence OGD use (Cantador, Cortés-Cediel, & Fernández, 2020; Wu, 2020). Socioeconomic factors, transparency, and lack of awareness influence the use of OGD (Callinan et al., 2017) that subsequently prevent society from taking advantage of the openness of government data. OGD promotes transparency and participation (Janssen et al., 2012) and citizens should be aware of the OGD data (Varga et al., 2014). Empirical studies found that transparency is essential in making OGD possible to use (Huijboom & Van den Broek, 2011; Janssen et al., 2012; Zuiderwijk et al., 2012). Open data must result in a product that enhances community accountability, economic growth, social cohesion, and transparency (Varga et al., 2014).

The emergence of ICT improves the efficiency and effectiveness of government administrations and enhances government services for citizens (Gichoya, 2005). OGD portals offer fresh, cutting-edge services to the public and can act as a catalyst for the development of new public services (McBride et al., 2018) and it should follow privacy principles. The price of internet access should be economical for all users of open data. Citizens experience that OGD portals are not comprehensible, even though computer experts can utilize the portal (Varga et al., 2014). E-government systems could minimize the prospects of corruption and therefore will increase the citizens' trust (Bertot, Jaeger & Grimes, 2010). The citizens need to become aware of how to use of open data, to increase their understanding of data and enhance their trust in data. There should be a channel for users to share their ideas, suggestions for improving data and publishing new data, etc. by using social media forums. The responsible authorities for publishing open data need to answer users regarding their queries (Varga et al., 2014). Lack of broadband connectivity, lack of e-literacy, expensive computer systems, and other equipment, and delays in policy in government administration are factors in the ICT development side (Nayak, 2013).

Datasets can be considered high-value if they fulfil the subsequent standards: data should be published by-laws, such as controlled by acts, commands, etc.; the data described the governmental activities; the high level of readiness of data; and data of high value in general. These high-value datasets attract users and increase their interest in using OGD portals. Open data initiatives also require participation from non-governmental groups, charitable organizations, and industrial organizations (Fioretti, 2012).

Resources, time, as well as skills have a major effect on the use of OGD (Craveiro et al., 2016). Moreover, networks, contacts, and feedback also have an influence on how the new public service is designed, developed, and implemented (McBride et al., 2018). Many factors exist that affect the usage of open data. However, there are numerous tools available to minimize or eliminate these effects, such as visualization that enables inexperienced users to exploit open data. The success of open data systems depends on how well people use and value the data that is made available to them (Janssen et al., 2012).

The data sets of OGD should be complete and recent for raising the social and economic value (Saxena, 2018). The OGD has not yet attained a degree of acceptable standardization that a serious issue while using accessible government data (Magalhães & Roseira, 2016). Moreover, Varga et al., (2014) argued that the graphical interface of OGD portals must be user-friendly and these portal themes must be in line with the preferences of data users and dependent on regional conditions. The process of finding, comprehending, and using open data is time-consuming, complex, and skill-intensive. Consequently, a threshold exists for the average person to use open data since they lack the statistical expertise to do so. Stakeholders, journalists, and researchers can use OGD to strengthen their position in their respective fields (Zuiderwijk & Janssen, 2014). Nyakwende and Al Mazari (2012) discussed, with optimism, how easy access to broadband communication networks and the proliferation of smartphones with technological developments lead to the facilitating of OGD initiatives.

OGD is perceived imperative for users in order to endorse government effectiveness and improved citizenship (Albano & Reinhard 2014). Poor quality, understanding difficulty, and limited time are factors that were encountered while reusing open data (Saxena, 2018). Internet connectivity problems may reduce proper usage of OGD (Hellberg & Hedström, 2015) and citizens need help from experts to improve their skills to use OGD (Canares et al., 2016).

6. Limitations and Future Research

This systematic review was restricted to the studies published on the use of OGD from citizens' perspectives in the English language. The researcher used the term ("Open government data" OR "Open data" OR Open data Portals" AND "Citizen") in the query used for this systematic review. Other terms, i.e. "government data portal", "government open data", "government open data portal", "public government data", "public open data" etc. may be used for open government data. So, this systematic review may be missing articles that used the above terms interchangeably with open government data. Future research may welcome conducting a meta-analysis on OGD from citizens' perspectives. Furthermore, future studies also deliberate on the differences in the social and economic context of countries/societies where OGD is supplied and consumed.

7. Theoretical and Practical Implications

The current study will be helpful for government authorities and policymakers, regarding IT development, in terms of technological factors that affect ease of access and accessibility of OGD portals. The findings of the current study will also be beneficial for decision-makers of government authorities in devising policies regarding awareness, motivation, and development of digital literacy skills among people regarding OGD.

This research is a valuable addition to the literature on OGD regarding factors affecting the usage of OGD portals, from citizens' perspectives. It would be helpful at government level in the identification of factors that affect OGD. Local bodies may aware of citizens' perceptions and problems. At

the citizens' level they will be aware of the importance of OGD in their lives, and may become responsive to factors that influence OGD use.

8. Recommendations and Conclusion

ICT4D (Information and communication technology for development) is an initiative aimed at bridging the digital divide and assisting economic development by accessing communication technologies. It is the base needed in order for the OGD initiatives to cultivate a prosperous society (Johan et al., 2013). The current study reviewed literature published from citizens' viewpoints in the area of OGD. Citizens get access to government data to fulfil their everyday information needs. Citizens perceived OGD portals to be a means of communication with the government (Weerakkody et al., 2017). The current study investigated citizens' satisfaction the use of OGD. It also identified models, theoretical frameworks, and theories, which have been specified (i.e., applied, developed, or tested) in earlier research studies about citizens' satisfaction with OGD. It also identified factors that affect the use of OGD portals, including transparency, accessibility, usefulness and usability, and OGD training. Moreover, motivation of citizens, computer skills, individual differences, socio-economic factors, and lack of awareness among citizens also affected their use of OGD that subsequently prevent citizens to take benefit from these data sets.

Literature established that government should consider the factors that affect OGD use in order to increase its usage among citizens. Government should conduct training for citizens to develop their digital literacy skills before the introduction and implementation of any technology-based services.

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